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Harmon, III et al.

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(54) **DUAL CONNECTOR SYSTEM**

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(58) **Field of Classification Search**

CPC H01R 12/7076; H01R 12/721; H01R 12/714; H01R 12/716; H01R 13/113; H01R 13/6275; H01R 13/62988; H01R 13/6335; H01R 13/665; H01R 13/6587; H01R 24/60

See application file for complete search history.

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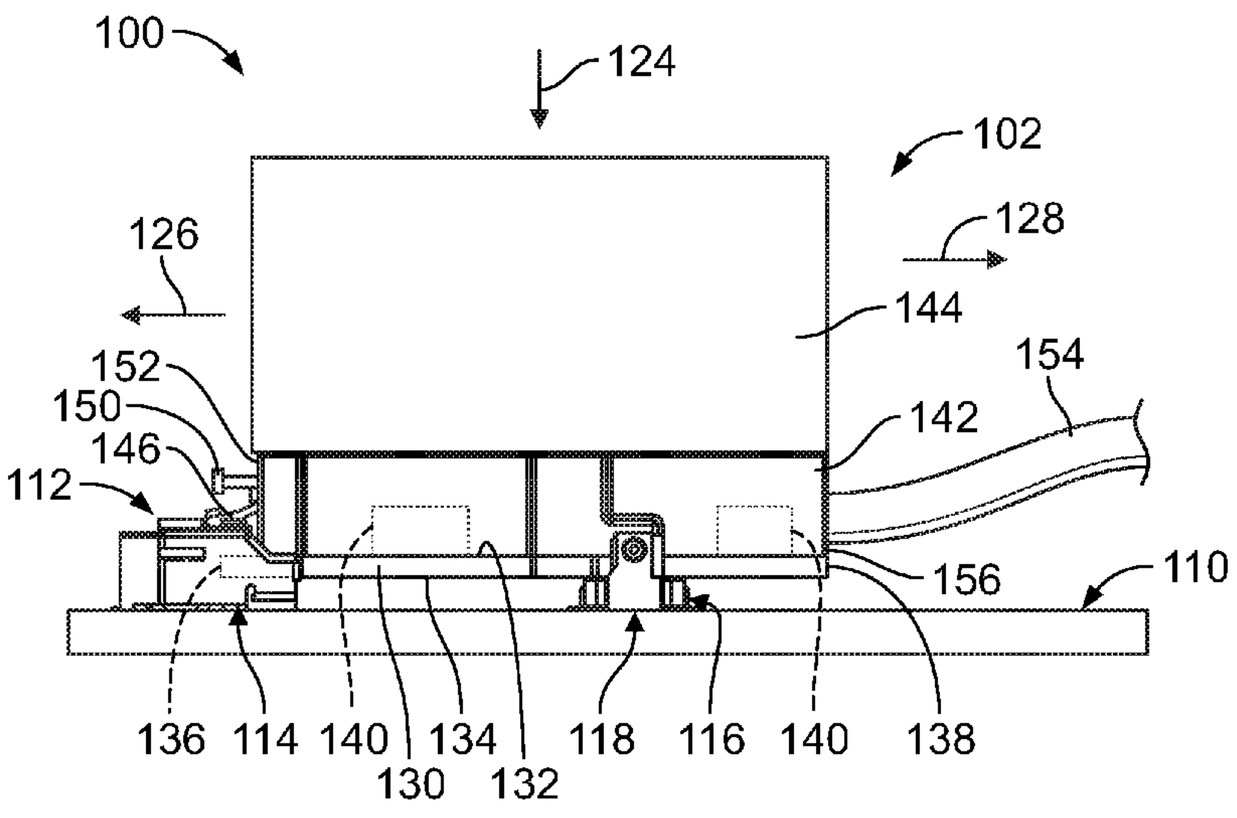
(57) **ABSTRACT**

A dual connector system includes a host circuit board and first and second electrical connectors for electrically connecting to a module circuit board of a dual connector module. The dual connector module has a latch at a front wall movable between a latched position and an unlatched position. The latch engages a latching feature of the first electrical connector in the latched position. The dual connector module has an ejector at the front wall operably coupled to the latch. The ejector is actuated in an actuation direction to release the latch and eject the dual connector module from the mated position to the unmated position after the latch is moved from the latched position to the unlatched position.

20 Claims, 5 Drawing Sheets



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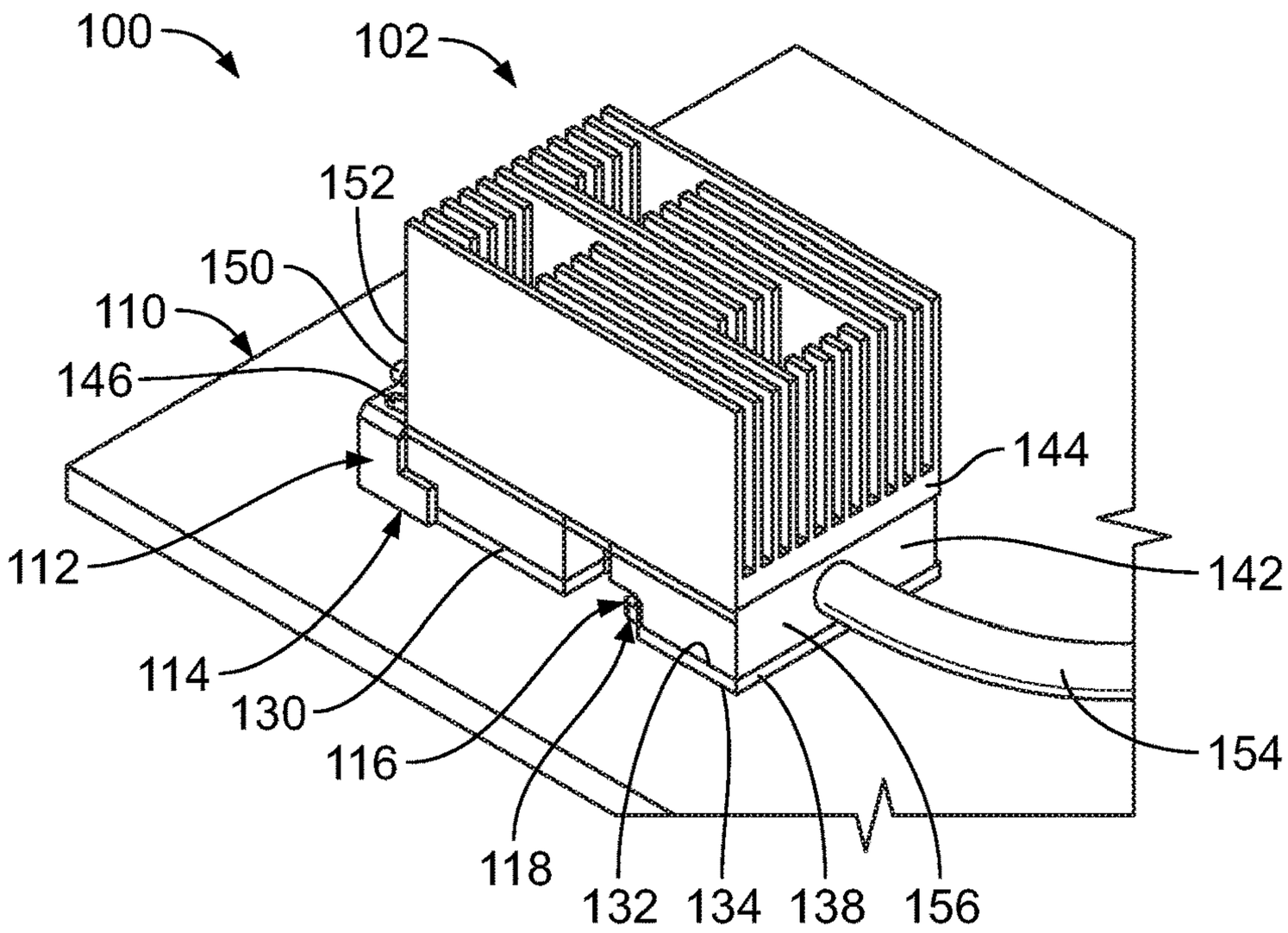
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FIG. 1

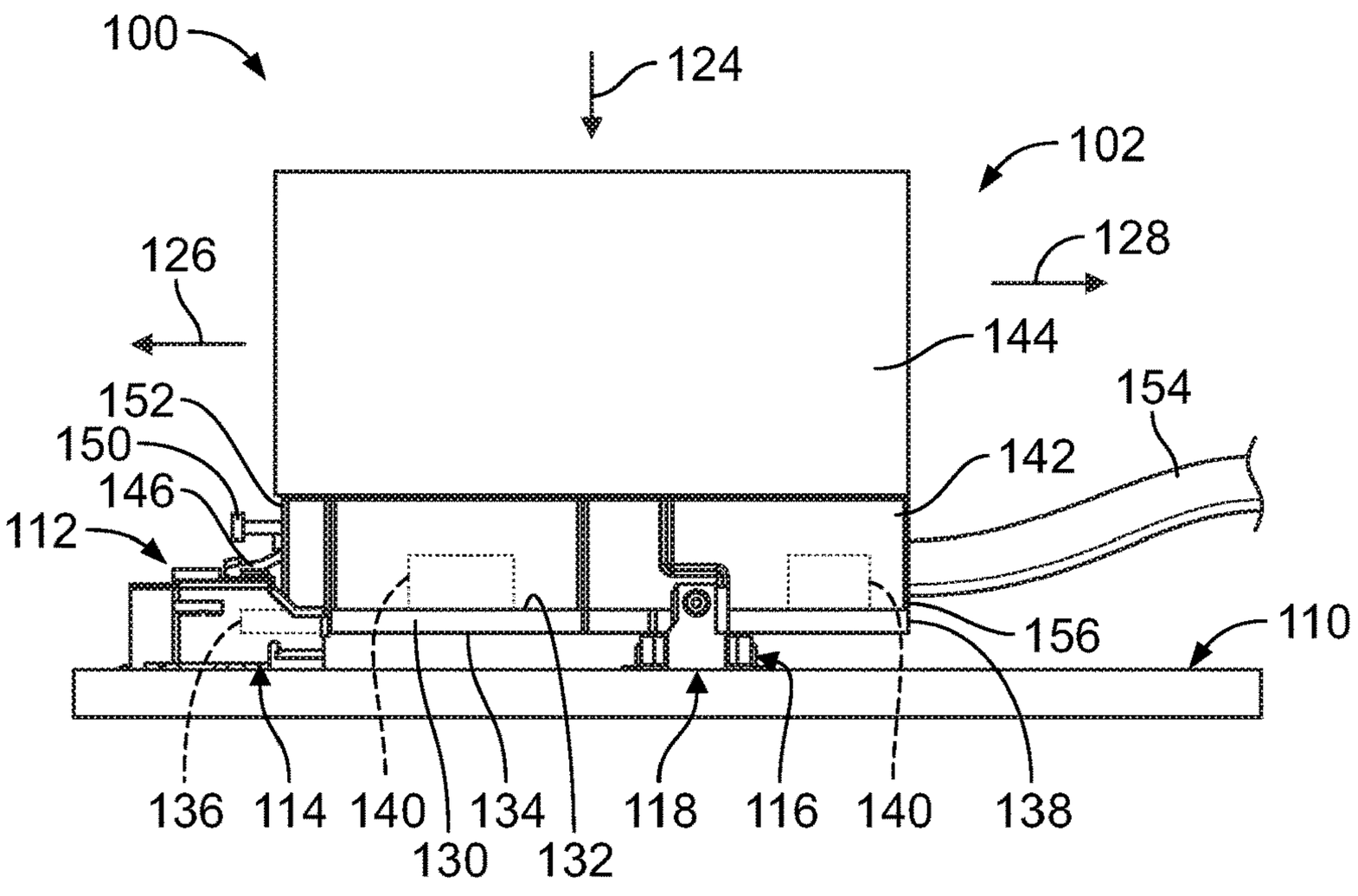
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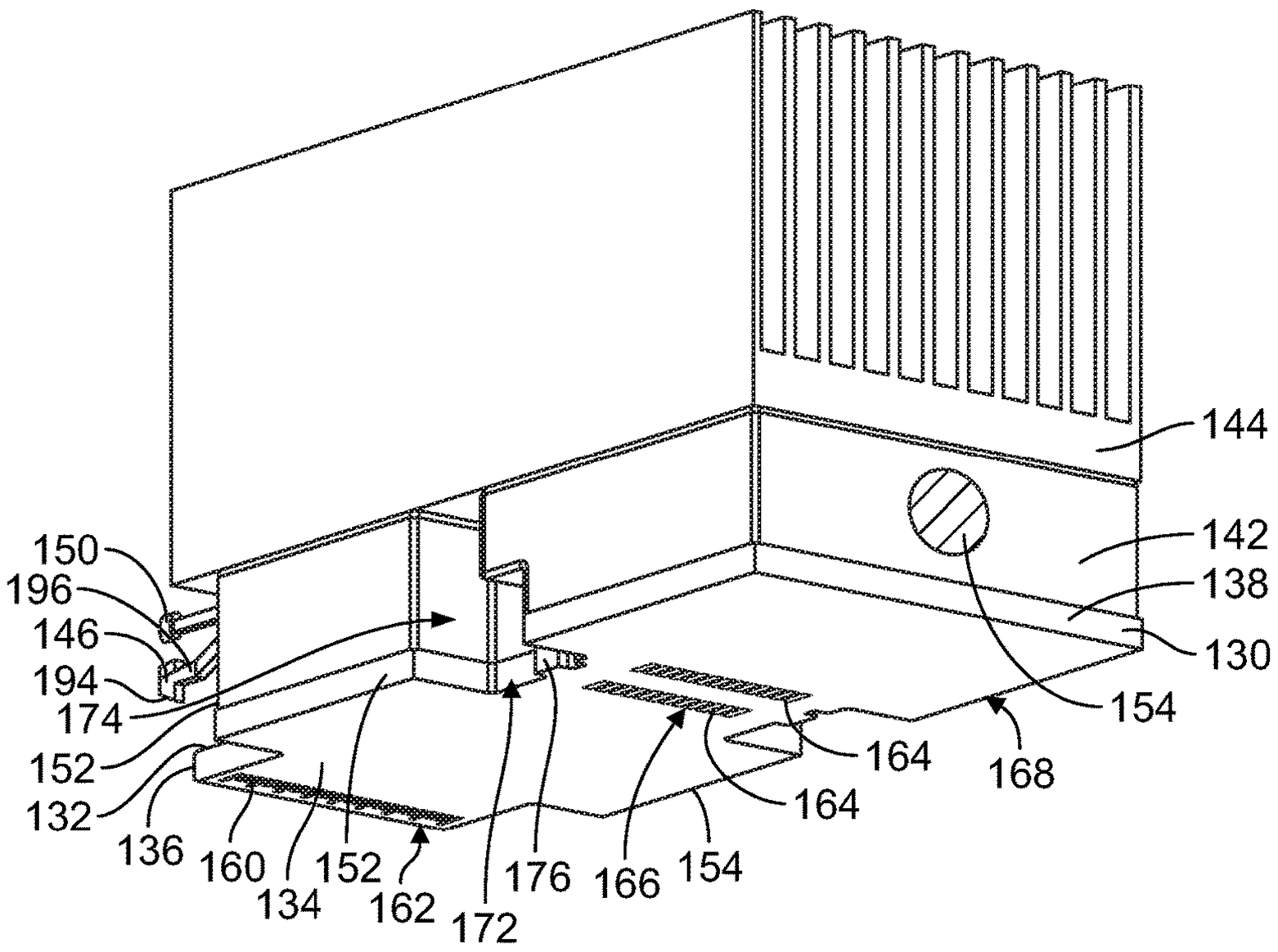
FIG. 2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164
168
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166
154

FIG. 3

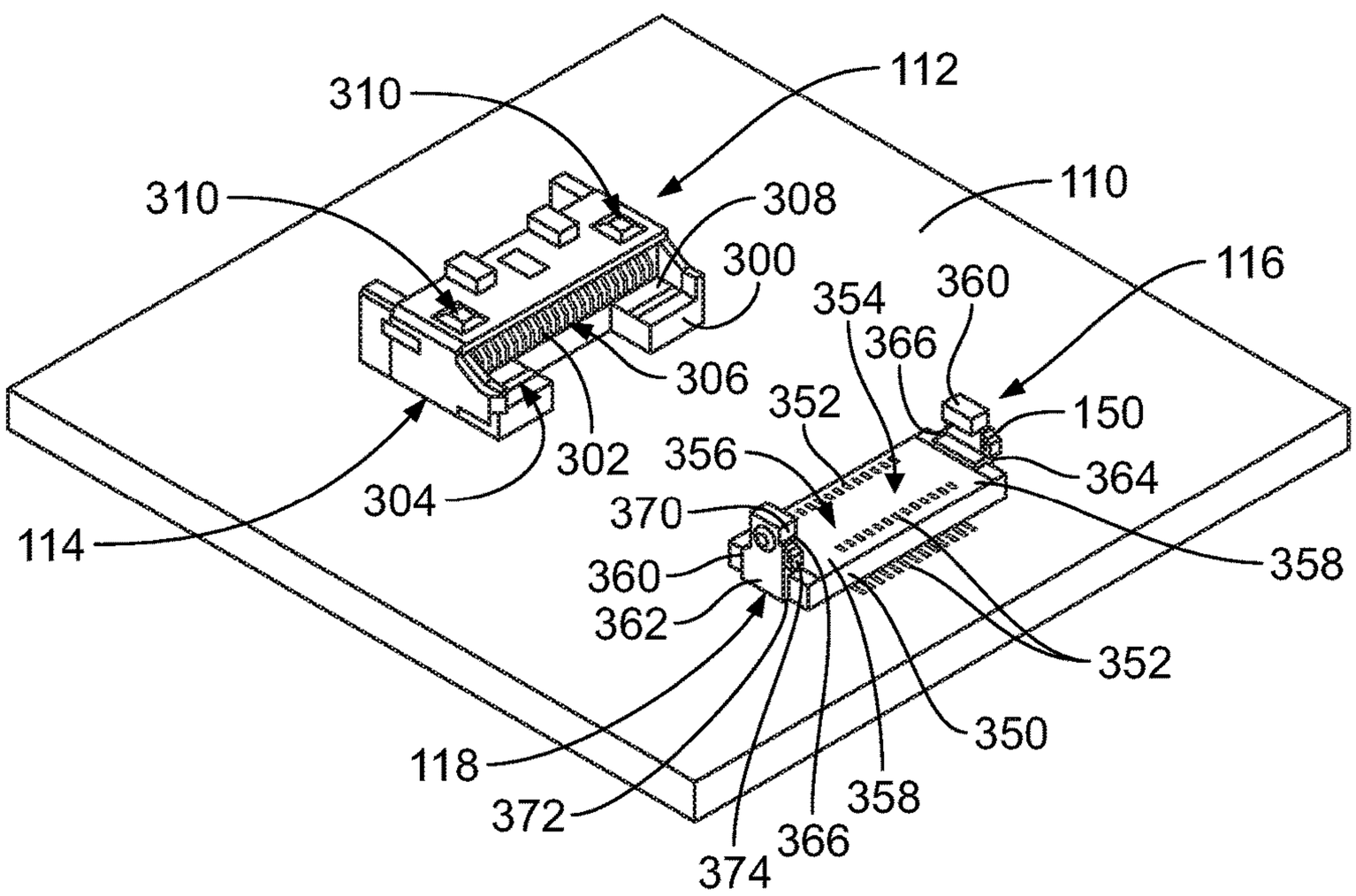
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FIG. 4

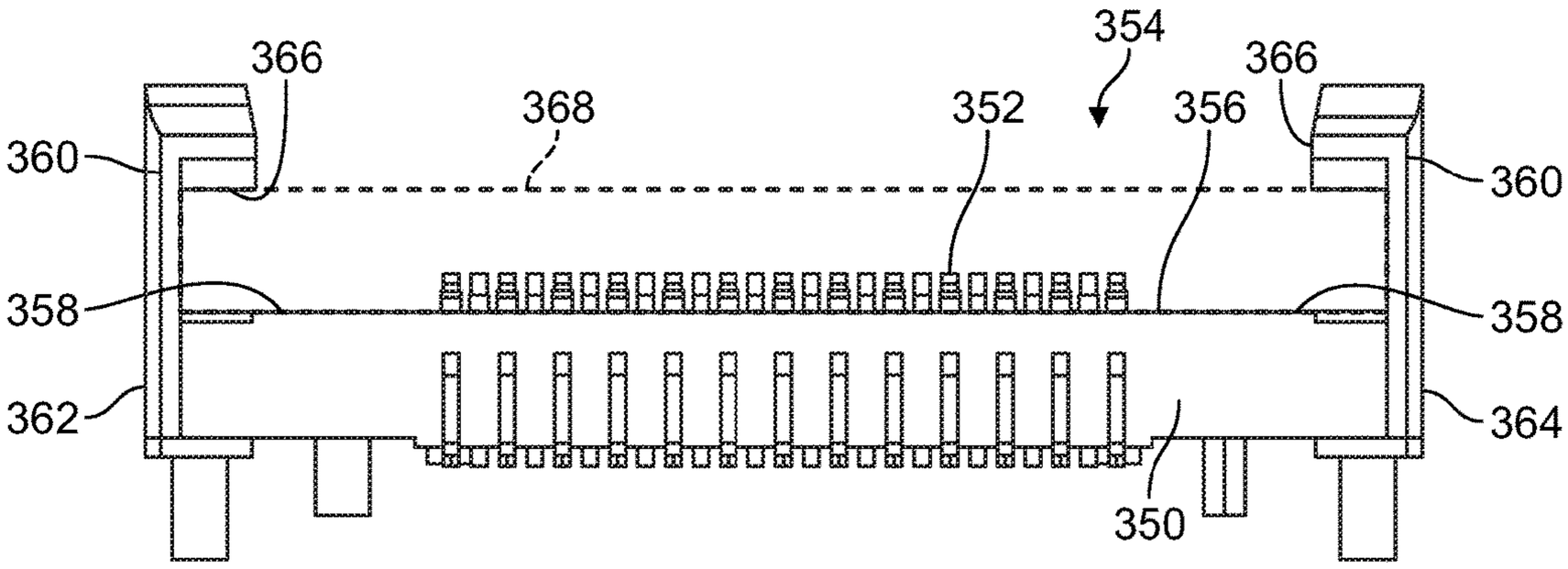
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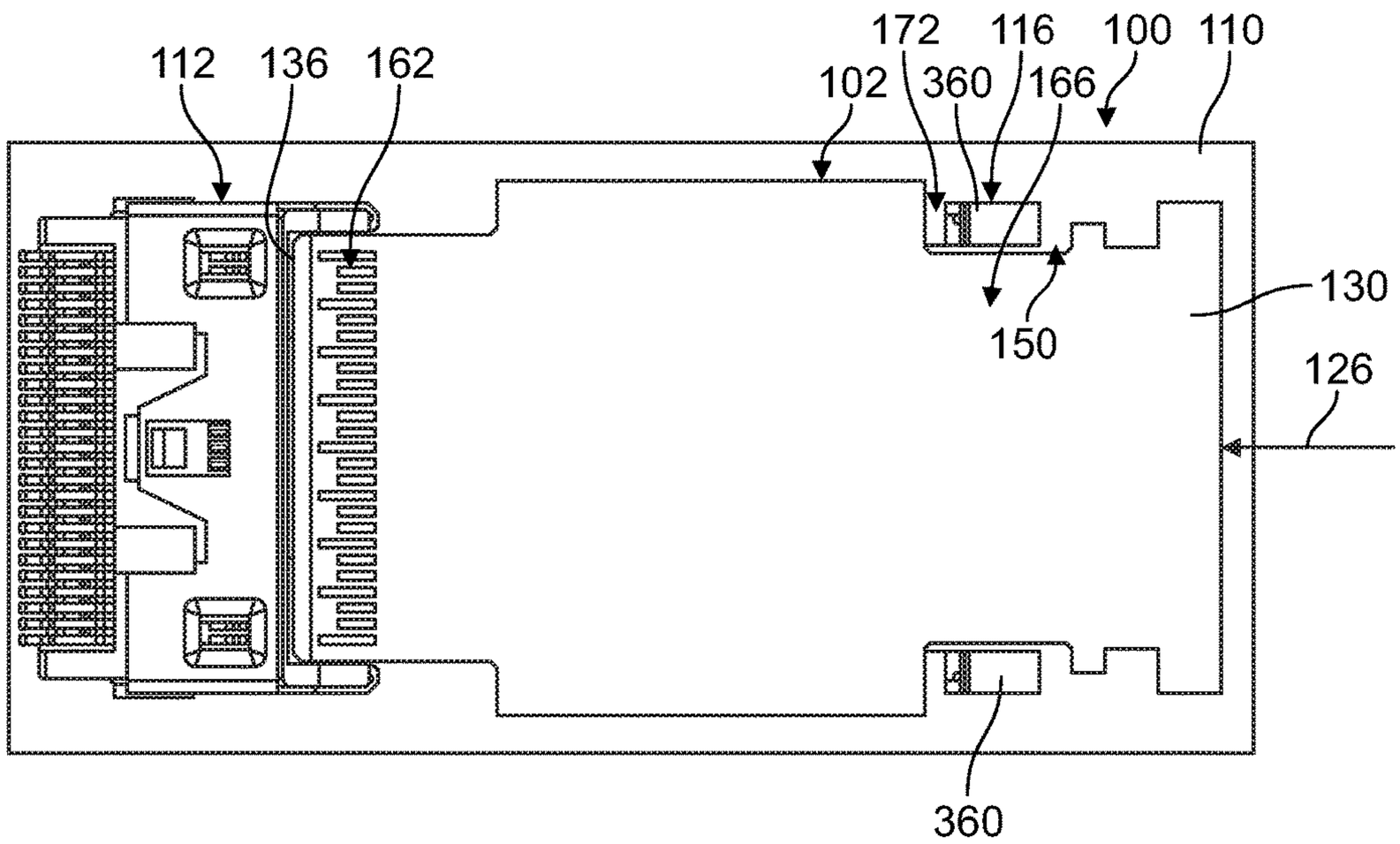
FIG. 5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150
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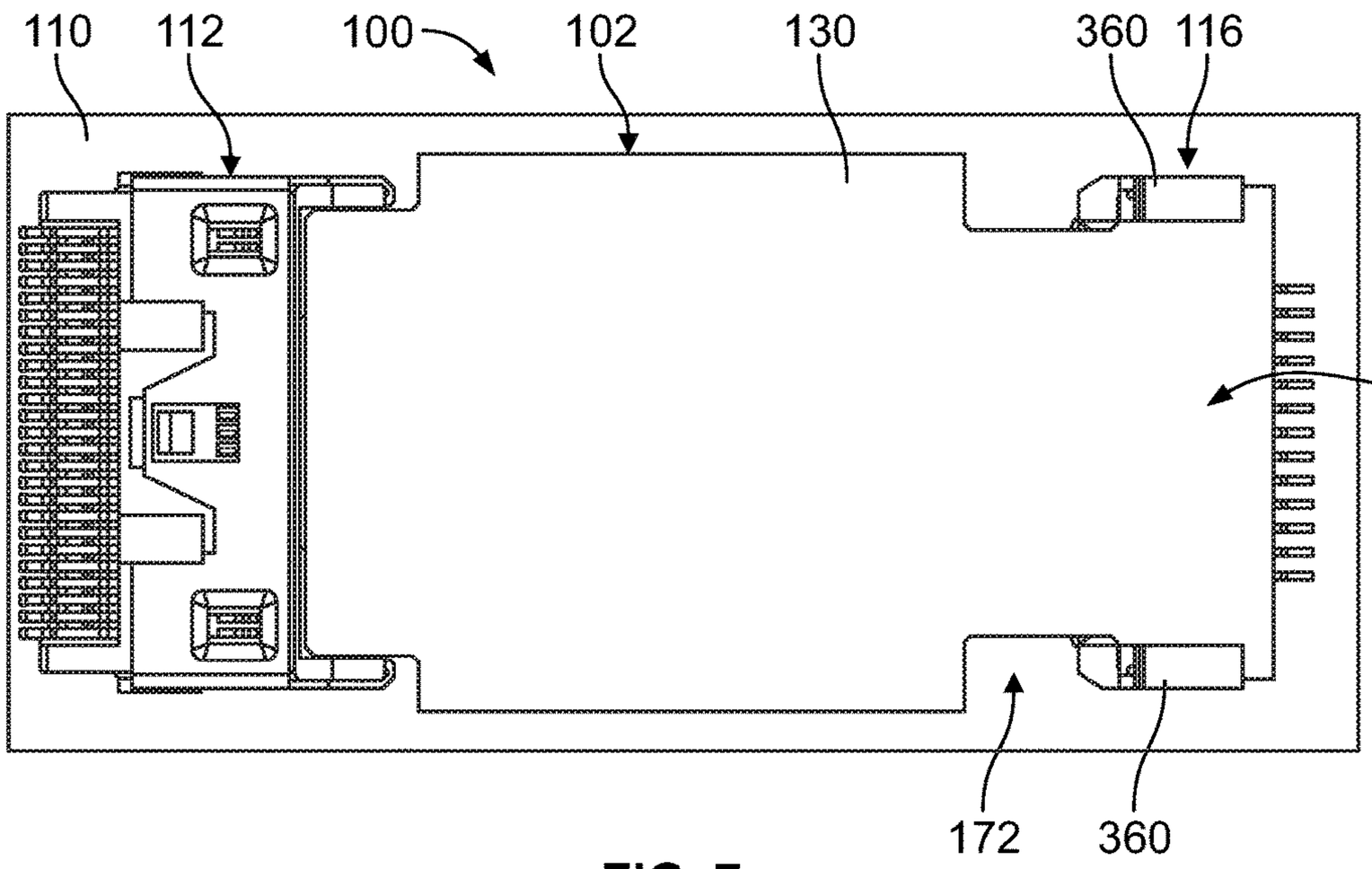
FIG. 6


110
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166
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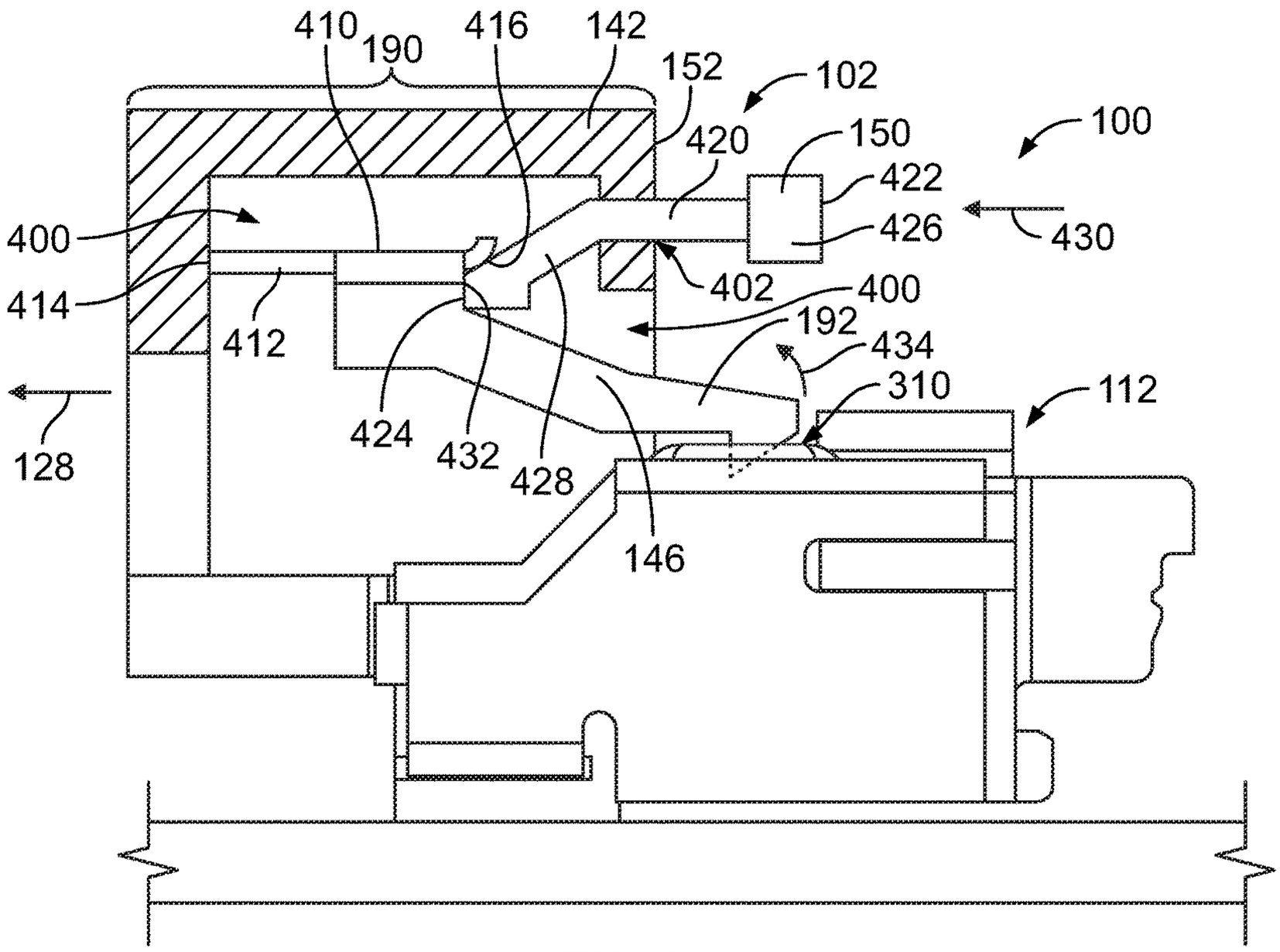
FIG. 7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128
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FIG. 8

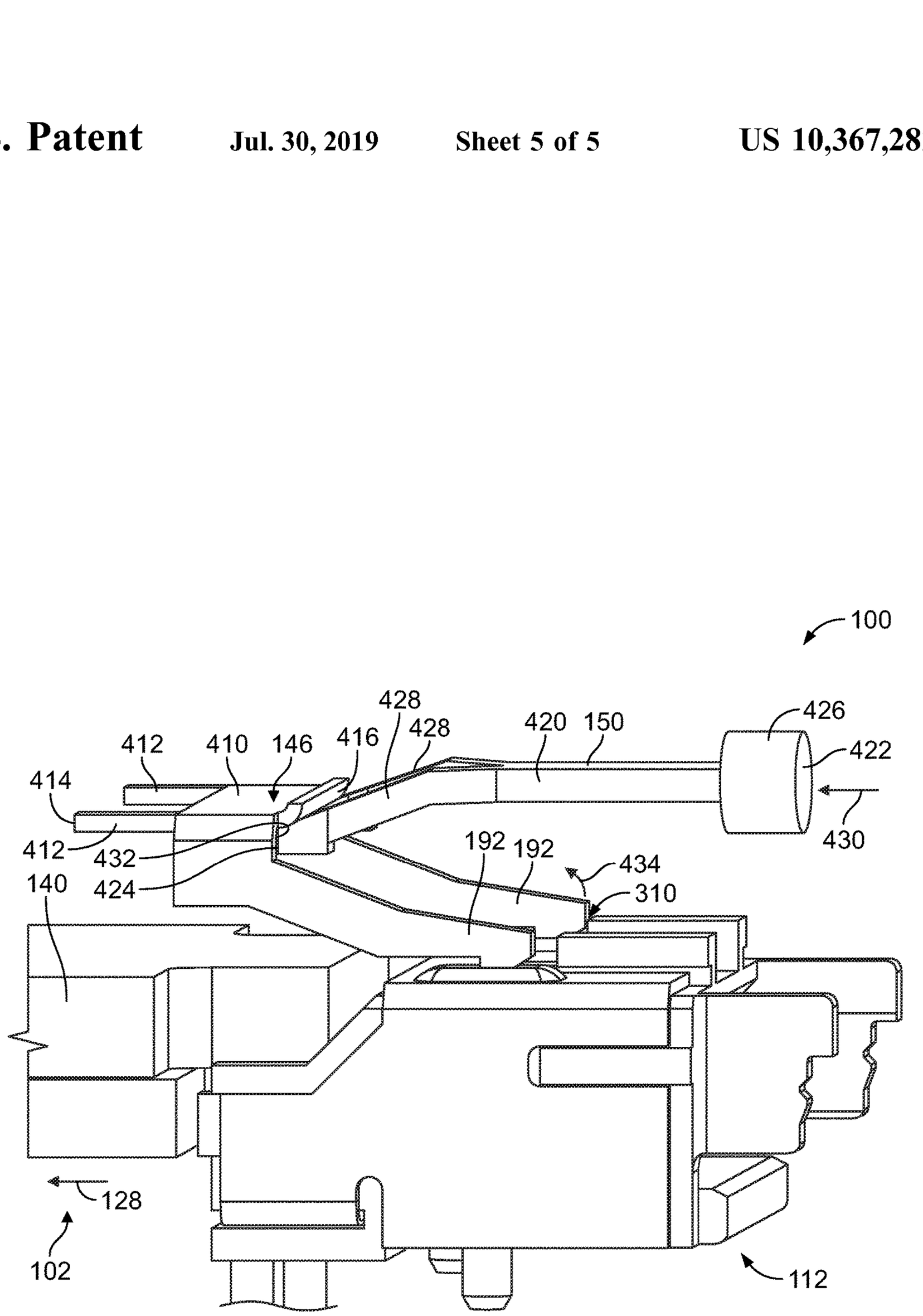
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FIG. 9

DUAL CONNECTOR SYSTEM

BACKGROUND OF THE INVENTION

The subject matter herein relates generally to a dual connector system.

Dual connector systems include first and second electrical connectors mounted to a host circuit board that are electrically connected to a dual connector module. The dual connector module includes a module circuit board having connector interfaces for interfacing with the first and second electrical connectors. Typically communication components are mounted to the module circuit board. For example, electrical and/or optical components may be mounted to the module circuit board. In various applications an on-board optics module may be mounted to the module circuit board. Heat dissipation of the communication components may be provided, such as in the form of a heat sink thermally coupled to the communication components and supported by the module circuit board.

Mating of the dual connector module to the first and second electrical connectors typically involves loading the dual connector module into a first position in a vertical direction and then sliding the dual connector module to a second position in a horizontal direction to mate with the first and second electrical connectors. However, unmating of the dual connector module may be difficult. For example, the dual connector module needs to be moved horizontally rearward out of the card slot at the front end before being lifted upward off of the first and second electrical connectors. Conventional dual connector modules include complex latching components having multiple parts used to release the dual connector module. For example, some conventional dual connector modules use a tether that extends to the rear end of the dual connector module to release the latch and pull the dual connector module rearward. However, some conventional dual connector modules include cables extending from the rear end of the dual connector module that interfere with the tether. Additionally, actuation or pulling on the tether may damage the cables, such as by bending the cables beyond a bend limit of the cables.

A need remains for a dual connector system that provides a mechanism for unmating the dual connector module from the first and second electrical connectors.

BRIEF DESCRIPTION OF THE INVENTION

In one embodiment, a dual connector system is provided including a host circuit board having a front mounting area and a rear mounting area, a first electrical connector at the front mounting area of the host circuit board, and a second electrical connector at the rear mounting area of the host circuit board. The first electrical connector has a housing having a card slot holding first contacts at the card slot being terminated to the host circuit board. The first electrical connector has a latching feature. The second electrical connector has a housing having an upper mating surface holding second contacts at the upper mating surface being terminated to the host circuit board. The dual connector system includes a dual connector module movable between a mated position and an unmated position with the first and second electrical connectors. The dual connector module has a module circuit board including an upper surface and a lower surface facing the host circuit board. The module circuit board has at least one communication component on the upper surface. The module circuit board extends between a front edge and a rear edge. The module circuit board has front contact pads proximate to the front edge for electrically connecting to the first electrical connector. The module circuit board has rear contact pads remote from the front edge for electrically connecting to the second electrical connector. The dual connector module has a front wall proximate to the front edge having a latch at the front wall movable between a latched position and an unlatched position. The latch engages the latching feature of the first electrical connector in the latched position to hold the dual connector module in the mated position with the first electrical connector. The dual connector module has an ejector at the front wall operably coupled to the latch. The ejector is actuated in an actuation direction to release the latch and eject the dual connector module from the mated position to the unmated position after the latch is moved from the latched position to the unlatched position.

In another embodiment, a dual connector system is provided including a host circuit board having a front mounting area and a rear mounting area, a first electrical connector at the front mounting area of the host circuit board, and a second electrical connector at the rear mounting area of the host circuit board. The first electrical connector has a housing having a card slot holding first contacts at the card slot being terminated to the host circuit board. The first electrical connector has a latching feature. The second electrical connector has a housing having an upper mating surface holding second contacts at the upper mating surface being terminated to the host circuit board. The dual connector system includes a dual connector module movable between a mated position and an unmated position with the first and second electrical connectors. The dual connector module has a module circuit board including an upper surface and a lower surface facing the host circuit board. The module circuit board has at least one communication component on the upper surface. The module circuit board extends between a front edge and a rear edge. The module circuit board has front contact pads proximate to the front edge for electrically connecting to the first electrical connector. The module circuit board has rear contact pads remote from the front edge for electrically connecting to the second electrical connector. The dual connector module has a front wall proximate to the front edge. The dual connector module has a latch at the front wall movable between a latched position and an unlatched position. The latch engages the latching feature of the first electrical connector in the latched position. The dual connector module is coupled to the host circuit board by lowering the dual connector module in a loading direction generally perpendicular to the host circuit board to a pre-staged, unmated position where the first connector interface is adjacent to the first electrical connector and the second connector interface is adjacent to the second electrical connector. The dual connector module is slid forward from the pre-staged, unmated position to a mated position in a mating direction generally parallel to the upper surface of the host circuit board to mate the first connector interface to the first electrical connector by loading the front edge of the module circuit board into the card slot of the first electrical connector to mate the first contacts to the first contact pads and to mate the second connector interface to the second electrical connector to mate the second contacts to the second contact pads. The dual connector module includes an ejector at the front wall being operably coupled to the latch. The ejector is actuated in an actuation direction parallel to the host circuit board to release the latch and eject the dual connector module in an unmating direction from the mated position to

the unmated position after the latch is moved from the latched position to the unlatched position.

In a further embodiment, a dual connector system is provided including a host circuit board having a front mounting area and a rear mounting area, a first electrical connector at the front mounting area of the host circuit board, and a second electrical connector at the rear mounting area of the host circuit board. The first electrical connector has a housing having a card slot holding first contacts at the card slot being terminated to the host circuit board. The first electrical connector has a latching feature. The second electrical connector has a housing having an upper mating surface holding second contacts at the upper mating surface being terminated to the host circuit board. The dual connector system includes a dual connector module movable between a mated position and an unmated position with the first and second electrical connectors. The dual connector module has a module circuit board including an upper surface and a lower surface facing the host circuit board. The module circuit board has at least one communication component on the upper surface. The module circuit board extends between a front edge and a rear edge. The module circuit board has front contact pads proximate to the front edge for electrically connecting to the first electrical connector. The module circuit board has rear contact pads remote from the front edge for electrically connecting to the second electrical connector. The dual connector module has a front wall proximate to the front edge having a latch at the front wall movable between a latched position and an unlatched position. The latch engages the latching feature of the first electrical connector in the latched position to hold the dual connector module in the mated position with the first electrical connector. The dual connector module has a shell on the module circuit board and a latch coupled to the shell and being movable between a latched position and an unlatched position. The latch has a base, a support beam extending from the base to a fixed end fixed to the shell, and a latching beam extending from the base being configured to engage the latching feature of the first electrical connector when the dual connector module is in the mated position. The latch is releasable by lifting the latch from the latched position to the unlatched position using an actuator. The support beam is elastically deformed from the fixed end when the latch is moved from the latched position to the unlatched position. The support beam returns to an undeformed state when the lifting force is released to return the latch to the latched position.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a dual connector system formed in accordance with an exemplary embodiment showing a dual connector module mounted to a host circuit board.

FIG. **2** is a side view of the dual connector system showing the dual connector module mounted to the host circuit board.

FIG. **3** is a bottom perspective view of the dual connector module in accordance with an exemplary embodiment.

FIG. **4** is a top perspective view of the host circuit board in accordance with an exemplary embodiment.

FIG. **5** is an end view of a second electrical connector of the host circuit board in accordance with an exemplary embodiment.

FIG. **6** is a top view of a portion of the dual connector system showing a module circuit board partially mated to the host circuit board.

FIG. **7** is a top view of a portion of the dual connector system showing the module circuit board fully mated to the host circuit board.

FIG. **8** is a side, partial sectional view of a portion of the dual connector system showing the dual connector module mated to a first electrical connector.

FIG. **9** is a perspective view of a portion of the dual connector system showing the dual connector module mated to the first electrical connector.

DETAILED DESCRIPTION OF THE INVENTION

FIG. **1** is a perspective view of a dual connector system **100** formed in accordance with an exemplary embodiment showing a dual connector module **102** mounted to a host circuit board **110**. FIG. **2** is a side view of the dual connector system **100** showing the dual connector module **102** mounted to the host circuit board **110**. The host circuit board **110** has a first electrical connector **112** at a front mounting area **114** of the host circuit board **110** and a second electrical connector **116** at a rear mounting area **118** of the host circuit board **110**.

When the dual connector module **102** is mounted to the host circuit board **110**, the dual connector module **102** interfaces with both electrical connectors **112**, **116**. Optionally, the dual connector module **102** may be simultaneously mated with the first and second electrical connectors **112**, **116** during a mating process. In an exemplary embodiment, the first electrical connector **112** is a different type of electrical connector than the second electrical connector **116**. For example, the first electrical connector **112** may be a front loaded electrical connector, such as a card edge connector. The second electrical connector **116** may be a top loaded electrical connector, such as a mezzanine connector. The electrical connectors **112**, **116** may be used for different types of signaling. For example, the first electrical connector **112** may be used for high-speed signaling while the second electrical connector **116** may be used for low speed signaling, powering, or for another type of connection.

In an exemplary embodiment, mating of the dual connector module **102** to the host circuit board **110** occurs by loading the dual connector module **102** in a loading direction **124** (for example, downward) to a pre-staged position and then mating the dual connector module **102** in a mating direction **126** (for example, forward) to a mated position. The dual connector module **102** may be unmated in an opposite unmating direction **128** (for example, rearward) to an unmated position and then removed from the host circuit board **110** by lifting the dual connector module **102** upward. The loading direction **124** may be perpendicular to the host circuit board **110**, such as in a vertical direction, and the mating and unmating directions **126**, **128** may be parallel to the host circuit board **110**, such as in horizontal directions. In an exemplary embodiment, the dual connector module **102** is moved in the unmating direction **128** using an ejector **150** at a front end **152** of the dual connector module **102** that pushes the dual connector module **102** rearward.

The dual connector module **102** includes a module circuit board **130** having an upper surface **132** and a lower surface **134**. The module circuit board **130** extends between a front edge **136** (shown in phantom) and a rear edge **138**. The lower surface **134** faces the host circuit board **110** and may be parallel to and spaced apart from the host circuit board **110** when mated to the electrical connectors **112**, **116**.

In an exemplary embodiment, the dual connector module **102** includes one or more communication components **140**

on the upper surface **132** and/or the lower surface **134**. The communication components **140** may be electrical components, optical components, or other types of components. In an exemplary embodiment, one or more of the communication components **140** may be on-board optical modules. The communication components **140** may include optical/digital converters for converting between optical and electrical signals. Other types of communication components **140** may be provided on the module circuit board **130**, such as processors, memory modules, antennas, or other types of components.

In an exemplary embodiment, the dual connector module **102** includes a housing or shell **142** on the upper surface **132**. The shell **142** encloses the communication components **140**. In an exemplary embodiment, the shell **142** extends generally around the perimeter of the module circuit board **130**; however, portions of the module circuit board **130** may be exposed exterior of the shell **142**. In an exemplary embodiment, the dual connector module **102** includes a heat sink **144** thermally coupled to one or more of the communication components **140**. The heat sink **144** dissipates heat from the communication components **140**. The heat sink **144** may be mounted to the shell **142** and/or the module circuit board **130**. In an exemplary embodiment, the heat sink **144** extends substantially the entire length of the dual connector module **102**. The heat sink **144** may have a plurality of fins having a large surface area for dissipating heat.

In an exemplary embodiment, the dual connector module **102** includes a latch **146** at the front end **152** of the dual connector module **102** for latchably securing the dual connector module **102** to the first electrical connector **112**. The ejector **150** is coupled to the latch **146** for releasing the latch **146**. In the illustrated embodiment, the latch **146** and the ejector **150** both extend forward of the front end **152** of the dual connector module **102**, such as forward of the shell **142**. In an exemplary embodiment, the latch **146** is coupled to and supported by the shell **142** and/or the ejector **150** is coupled to and supported by the shell **142**. The ejector **150** is configured to be pushed inward into the shell **142** to an actuated position to release the latch **146** from a latched position to an unlatched position. In an exemplary embodiment, the ejector **150** is used to lift the latch **146** upward, such as in a direction perpendicular to the mating direction of the module circuit board **130**, to release the latch **146**. Once the latch **146** is released, the dual connector module **102** is able to be moved rearward in the unmating direction **128**. The latch **146** may be pivoted upward from the latched position to the unlatched position. The latch may be pivoted downward to return from the unlatched position to the latched position. Optionally, as the latch **146** is returned downward, the latch **146** may force the ejector **150** forward to return to a released position. In other various embodiments, another component, such as a return spring may be used to return the ejector **150** to the released position.

In an exemplary embodiment, the ejector **150** is at the front end **152** and is accessible from above the dual connector module **102**. For example, because one or more cables **154** extend from a rear end **156** of the dual connector module **102**, the cable **154** may block access to the space rearward of the dual connector module **102**. Routing of a tether or other latch release component to the rear end **156** of the dual connector module **102** may be impractical because of the location of the cable **154** or limited access to the space behind the dual connector module **102**. Actuation of a tether may damage the cable **154**, such as from bending of the cable **154** out of the way to access the tether.

FIG. **3** is a bottom perspective view of the dual connector module **102** in accordance with an exemplary embodiment. In an exemplary embodiment, the module circuit board **130** includes front contact pads **160** proximate to the front edge **136** along the lower surface **134** and/or the upper surface **132**. The front contact pads **160** define a first connector interface **162** configured for electrically connecting to the first electrical connector **112** (shown in FIG. **2**). For example, the first connector interface **162** may be a card edge interface at the front edge **136** configured to be plugged into a card slot of the first electrical connector **112**. The front contact pads **160** are circuits of the module circuit board **130**. The front contact pads **160** may be electrically connected to corresponding communication components **140** (shown in FIG. **2**) via traces on various layers of the module circuit board **130**. In an exemplary embodiment, the front contact pads **160** convey high speed data signals. Optionally, various front contact pads **160** may be arranged in pairs configured to carry differential signals.

The module circuit board **130** includes rear contact pads **164** on the lower surface **134** that define a second connector interface **166** configured for electrically connecting to the second electrical connector **116** (shown in FIG. **2**). The rear contact pads **164** may be electrically connected to corresponding communication components **140** via traces on various layers of the module circuit board **130**. Optionally, at least some of the rear contact pads **164** may be power pads configured to transmit power between the second electrical connector **116** and the module circuit board **130** for powering the communication components **140**. Optionally, the rear contact pads **164** may be provided in multiple rows along the lower surface **134**. The rear contact pads **164** are provided at an intermediate portion **168** of the module circuit board **130** remote from the front edge **136** and remote from the rear edge **138**. Optionally, the rear contact pads **164** are positioned closer to the rear edge **138** than the front edge **136** and may be positioned at the rear edge **138** in some embodiments.

The module circuit board **130** includes cutouts **172** at the side edges near the intermediate portion **168**. The shell **142** includes pockets **174** above the cutouts **172**. The cutouts **172** and the pockets **174** are configured to receive portions of the second electrical connector **116** during mating of the dual connector module **102** to the second electrical connector **116** (FIG. **2**). In an exemplary embodiment, the module circuit board **130** includes landing pads **176** extending into the cutouts **172**. The landing pads **176** are configured to be engaged by the second electrical connector **116** to mechanically secure the dual connector module **102** to the second electrical connector **116**.

The latch **146** and the ejector **150** are provided at the front end **152**, such as at a front wall **190** of the shell **142**. The latch **146** includes one or more latching beams **192**. For example, in the illustrated embodiment, the latch **146** includes two latching beams **192** located near the opposite sides of the dual connector module **102**. The ejector **150** may be approximately centered between the latching beams **192** and/or between the sides of the dual connector module **102**. The latch **146** may be pivotably coupled to the front wall **190** of the shell **142**. In an exemplary embodiment, each latching beam **192** includes a hook **194** at the distal end thereof for latching to a corresponding latching feature of the first electrical connector **112**.

FIG. **4** is a top perspective view of the host circuit board **110** in accordance with an exemplary embodiment. The host circuit board **110** includes mounting areas for mounting the dual connector module **102** (shown in FIG. **3**) to the host

circuit board **110**. The mounting area is subdivided into the front mounting area **114** receiving the first electrical connector **112** and the rear mounting area **118** receiving the second electrical connector **116**.

With additional reference to FIG. **3** for reference to components of the dual pluggable module **102**, the first electrical connector **112** includes a housing **300** mounted to the host circuit board **110**. The housing **300** holds a plurality of first contacts **302** configured to be terminated to the host circuit board **110**. The housing **300** has a mating end **304** configured to be mated with the first connector interface **162** (FIG. **3**) of the dual connector module **102**. In an exemplary embodiment, the first electrical connector **112** includes a card slot **306** at the mating end **304**. The first contacts **302** are arranged in the card slot **306** for mating with the first connector interface **162**. For example, the first contacts **302** may be arranged in an upper row and a lower row for interfacing with the front contact pads **160** (FIG. **3**) on the upper surface **132** and the lower surface **134** at the front edge **136** of the module circuit board **130**.

The housing **300** includes locating surfaces **308** at the mating end **304** for locating the module circuit board **130** relative to the card slot **306** during mating. For example, the locating surfaces **308** may be upward facing surfaces configured to support the front edge **136** of the module circuit board **130** in the pre-staged position. The module circuit board **130** may slide along the locating surfaces **308** during mating as the front edge **136** of the module circuit board **130** is loaded into the card slot **306**. The locating surfaces **308** may support the module circuit board **130** in the mated position to prevent damage to the first contacts **302** from the weight of the dual connector module **102**.

The housing **300** includes one or more latching features **310**. The latching features **310** interact with the latch **146** of the dual connector module **102** to secure the dual connector module **102** to the first electrical connector **112**. For example, in the illustrated embodiment, the latching features **310** are openings in the top surface of the housing **300** that receive the hooks **194** of the latch **146**. The hooks **194** are releasable from the latching features **310**. In a latched position, the hooks **194** are received in the latching features **310** and retain the relative position of the dual connector module **102** with respect to the first electrical connector **112**. For example, the latch **146** retains the front edge **136** of the module circuit board **130** in the card slot **306**. When the latch **146** is released to an unlatched position, such as by pushing the ejector **150** inward, the dual connector module **102** may be unmated from the first electrical connector **112**. For example, the dual connector module **102** may be moved rearward, such as by pushing the ejector **150** rearward.

With additional reference to FIG. **5**, which is an end view of the second electrical connector **116** in accordance with an exemplary embodiment, the second electrical connector **116** includes a housing **350** mounted to the host circuit board **110**. The housing **350** holds a plurality of second contacts **352** configured to be terminated to the host circuit board **110**. The housing **350** has a mating end **354** (for example, defining the top) configured to be mated with the second connector interface **166** (FIG. **3**) of the dual connector module **102**. In an exemplary embodiment, the second electrical connector **116** includes an upper mating surface **356** at the mating end **354**. The second contacts **352** are arranged along the upper mating surface **356**, such as in one or more rows, for mating with the second connector interface **166**. The second contacts **352** may include deflectable spring beams configured to be resiliently biased against the second connector interface **166** when the dual connector module **102** is mated to the second electrical connector **116**.

The housing **350** includes locating surfaces **358** at the mating end **354** for locating the module circuit board **130** during mating. For example, the locating surfaces **358** may be upward facing surfaces configured to support the intermediate portion **168** of the module circuit board **130**. The housing **350** includes towers **360** extending above the locating surfaces **358**, such as at opposite sides **362**, **364** of the housing **350**. The towers **360** may be integral with the base of the housing **350**; however, the towers **360** may be separate components mounted to the base of the housing **350** in alternative embodiments. For example, the towers **360** may be die cast metal components attached to a molded plastic base of the housing **350** and/or the host circuit board **110** to provide additional rigidity for support and holding strength for the module circuit board **130** and/or to provide higher precision manufacturing and locating for the module circuit board **130**.

The towers **360** include ledges **366**, such as at distal or top ends of the towers **360**, extending over the second electrical connector **116**. The towers **360** and the ledges **366** form a gap **368** above the upper mating surface **356** that receives the module circuit board **130**. The ledges **366** are configured to engage the upper surface **132** of the module circuit board **130**, such as at the landing pads **176** (FIG. **3**), to retain the module circuit board **130** in the gap **368** between the ledges **366** and the upper mating surface **356**. The ledges **366** prevent lift-off of the module circuit board **130** when the dual connector module **102** is in the mated position. The module circuit board **130** is configured to bypass the towers **360** as the dual connector module **102** is loaded to the pre-staged position; however, when the dual connector module **102** is slid forward to the mated position, the module circuit board **130** is slid under the ledges **366** to the mated position.

The module circuit board **130** may slide along the locating surfaces **358** during mating as the front edge **136** of the module circuit board **130** is loaded into the card slot **306**. The locating surfaces **358** may support the module circuit board **130**, such as at the intermediate portion **168**, in the mated position to prevent damage to the second contacts **352** from the weight of the dual connector module **102**.

FIG. **6** is a top view of a portion of the dual connector system **100** showing the module circuit board **130** partially mated to the host circuit board **110**. FIG. **7** is a top view of a portion of the dual connector system **100** showing the module circuit board **130** fully mated to the host circuit board **110**. The release mechanisms **150** extend from the towers **360** to engage the module circuit board **130**; however the release mechanisms **150** may extend from the dual connector module **102** to engage the second electrical connector **116** or the first electrical connector **112** in alternative embodiments.

In an exemplary embodiment, mating of the dual connector module **102** to the host circuit board **110** (and the electrical connectors **112**, **116**) occurs by loading the dual connector module **102** in the loading direction **124** (shown in FIG. **2**) to the pre-staged, unmated position (FIG. **6**), such as by loading the dual connector module **102** downward onto the first and second electrical connectors **112**, **116**. Once positioned, the dual connector module **102** is mated to the first and second electrical connectors **112**, **116** by moving the dual connector module **102** in the mating direction **126** to the mated position (FIG. **7**).

During mating, the first connector interface **162** is generally aligned above the first electrical connector **112** and the

second connector interface **166** is generally aligned above the second electrical connector **116** and the module circuit board **130** is lowered into position on the first and second electrical connectors **112**, **116** to the pre-staged, unmated position. The front edge **136** of the module circuit board **130** rests on, and is supported by, the first electrical connector **112** in the pre-staged, unmated position (FIG. **6**). As the module circuit board **130** is lowered, the towers **360** of the second electrical connector **116** extend into the cutouts **172** in the module circuit board **130**. The release mechanisms **150** are received in the cutouts **172** at opposite sides of the module circuit board **130**.

As the dual connector module **102** is moved from the pre-staged, unmated position (FIG. **6**) to the mated position (FIG. **7**), the dual connector module **102** is latchably secured to the first electrical connector **112**, as described above. However, when the latch **146** (shown in FIG. **3**) is released, the dual connector module **102** may be pushed rearward by the ejector **150** to cause the dual connector module **102** to shift rearward to the unmated position.

FIG. **8** is a side, partial sectional view of a portion of the dual connector system **100** showing the dual connector module **102** mated to the first electrical connector **112**. FIG. **9** is a perspective view of a portion of the dual connector system **100** showing the dual connector module **102** mated to the first electrical connector **112**. FIG. **8** shows a portion of the dual connector module **102** in-section to illustrate the latch **146** and the ejector **150**. FIG. **9** has a portion of the dual connector module **102**, such as the shell **142**, removed to illustrate the latch **146** and the ejector **150**. FIGS. **8** and **9** illustrate the latch **146** in a latched position and illustrate the ejector in a released position.

The shell **142** includes the front wall **190** at the front end **152**. The front wall **190** may include multiple wall portions defining the front wall **190**, such as an inner wall portion and an outer wall portion and may include a gap or space between the wall portions. The front wall **190** extends forward of the communication component **140** and may extend over the top of the communication component **140**. In an exemplary embodiment, the front wall **190** is used to support the latch **146** and the ejector **150**. For example, the latch **146** may be movably coupled to the front wall **190** and/or the ejector **150** may be movably coupled to the front wall **190**. In the illustrated embodiment, a portion of the latch **146** is fixed to and cantilevered from the front wall **190** such that the latch **146** is pivotable about the fixed point with the front wall **190**. The latch **146** may be rotated between the latched and the unlatched positions from the fixed location on the front wall **190**. The front wall **190** includes pockets or slots **400** that allow the latch **146** to move within the front wall **190**. The latching beams **192** extend through the slots **400** forward of the front wall **190**. In the illustrated embodiment, a portion of the ejector **150** extends through the front wall **190** to interface with the latch **146**. The ejector **150** is movable forward and rearward relative to the front wall **190** between the released and actuated positions. The front wall **190** includes pockets or slots **402** that allow the ejector **150** to move within the front wall **190**.

The latch **146** includes a base **410** and one or more support beams **412** extending from the base **410** to fixed ends **414** configured to be fixed to the shell **142** at the front wall **190**. In the illustrated embodiment, the support beams **412** extend rearward from the base **410**. The latching beams **192** extend from the base **410**. In the illustrated embodiment, the latching beams **192** extend forward from the base **410**. The support beams **412** are configured to be resiliently deformed as the latch **146** is moved from the latched position to the unlatched position. For example, the support beams **412** may be elastically deformed as the latch **146** is moved from the latched position to the unlatched position. When the latch **146** is released, the support beams **412** may return to the undeformed state. For example, the support beams **412** may act as springs imparting a return force to return the latch **146** to the latched position.

In an exemplary embodiment, the latch **146** includes a cam surface **416**. For example, in the illustrated embodiment, the cam surface **416** is provided at the front end of the base **410**. The cam surface **416** is curved. The ejector **150** engages the cam surface **416**. When the ejector **150** is pressed rearward, the ejector **150** engages the cam surface **416** and/or the base **410** to drive the latch **146** to the unlatched position. When the ejector **150** is released, the cam surface **416** engages the ejector **150** and the return force returning the latch **146** to the latched position forces the ejector **150** to return to the released position. For example, as the support beams **412** forces the latch **146** downward to return to the latched position, the cam surface **416** drives against the ejector **150** to return the ejector **150** to the released position as the latch **146** is moved downward from the unlatched position to the latched position. Other types of return mechanisms may be used in alternative embodiments, such as a return spring acting on the latch **146** and/or the ejector **150**.

The ejector **150** includes a body **420** extending between an actuation end **422** and a latch end **424**. The ejector **150** includes an actuator **426** at the actuation end **422**. In the illustrated embodiment, the actuator **426** is a button configured to be pressed rearward by an operator. Other types of actuators may be provided in alternative embodiments. The latch end **424** is configured to engage the latch **146**. In the illustrated embodiment, the latch end **424** engages the front end of the latch **146**, such as at the cam surface **416**. In an exemplary embodiment, the ejector **150** includes a pair of ramps **428** at the latch end **424** that are positioned under the latch **146** and used to drive the latch **146** upward from the latched position to the unlatched position as the ejector **150** is pushed rearward. For example, the body **420** may be Y-shaped having the pair of ramps **428** at the latch end **424** and having a single trunk extending to the actuator **426**. The ramps **428** are spread apart from each other to engage opposite sides of the base **410** to lift the latch **146** at two different points to ensure even lifting of the latch **146**.

In an exemplary embodiment, the ejector **150** is accessible forward of the dual connector module **102** immediately above the first electrical connector **112**. The ejector extends forward of the front wall **190** and is configured to be pushed rearward toward the front wall **190** to actuate the latch **146**. The ejector **150** is actuated in an actuation direction **430** to release the latch **146** and eject the dual connector module **102** rearward in the unmating direction **128** from the mated position to the unmated position after the latch **146** is moved from the latched position to the unlatched position. For example, the ejector **150** is pushed rearward and driven into the latch **146**. The ramps **428** lift the latch **146** to the unlatched position. As the ejector **150** is pushed rearward, and when the latch **146** is released from the latching features **310**, the rearward force on the ejector **150** forces the dual connector module **102** rearward. For example, the body **420** may press against a portion of the dual connector module **102**, such as the front wall **190**. In various embodiments, the latch **146** includes pressing surfaces **432**, such as on the base **410** or the latching beams **192**. The ramps **428** may press against the pressing surfaces **432** to force the dual connector module **102** rearward. The ejector **150** forces the dual

connector module **102** in the unmating direction **128** as the ejector **150** is actuated in the actuation direction **430** after the latch **146** is moved to the unlatched position.

The ejector **150** is movable linearly parallel to the host circuit board **110** between the released position and the actuated position. For example, the ejector **150** is movable in a linear acting direction parallel to the actuation direction **430** to lift the latch **146** upward. When the ejector **150** is actuated, the latch **146** is lifted upward in an unlatching direction **434** perpendicular to the acting direction of the ejector **150**. In an exemplary embodiment, because the support beams **412** are fixed to the front wall **190**, the latch **146** is rotated upward from the latched position to the unlatched position as the ejector **150** is moved rearward to the actuated position. When the ejector **150** is released, the latch **146** is rotated downward from the unlatched position to the latched position. As the latch **146** returns downward, the latch **146** causes the ejector **150** to move forward to the released position. The cam surface **416** drives the ejector **150** forward as the latch **146** moves downward.

It is to be understood that the above description is intended to be illustrative, and not restrictive. For example, the above-described embodiments (and/or aspects thereof) may be used in combination with each other. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from its scope. Dimensions, types of materials, orientations of the various components, and the number and positions of the various components described herein are intended to define parameters of certain embodiments, and are by no means limiting and are merely exemplary embodiments. Many other embodiments and modifications within the spirit and scope of the claims will be apparent to those of skill in the art upon reviewing the above description. The scope of the invention should, therefore, be determined with reference to the appended claims, along with the full scope of equivalents to which such claims are entitled. In the appended claims, the terms "including" and "in which" are used as the plain-English equivalents of the respective terms "comprising" and "wherein." Moreover, in the following claims, the terms "first," "second," and "third," etc. are used merely as labels, and are not intended to impose numerical requirements on their objects. Further, the limitations of the following claims are not written in means-plus-function format and are not intended to be interpreted based on 35 U.S.C. § 112(f), unless and until such claim limitations expressly use the phrase "means for" followed by a statement of function void of further structure.

What is claimed is:

1. A dual connector system comprising:

a host circuit board having a front mounting area and a rear mounting area;

a first electrical connector at the front mounting area of the host circuit board, the first electrical connector having a housing having a card slot, the housing holding first contacts at the card slot, the first contacts being terminated to the host circuit board, the first electrical connector having a latching feature;

a second electrical connector at the rear mounting area of the host circuit board, the second electrical connector having a housing having an upper mating surface, the housing holding second contacts at the upper mating surface, the second contacts being terminated to the host circuit board;

a dual connector module movable between a mated position and an unmated position with the first and second electrical connectors, the dual connector module having a module circuit board including an upper surface and a lower surface facing the host circuit board, the module circuit board having at least one communication component on the upper surface, the module circuit board extending between a front edge and a rear edge, the module circuit board having front contact pads proximate to the front edge for electrically connecting to the first electrical connector, the module circuit board having rear contact pads remote from the front edge for electrically connecting to the second electrical connector, the dual connector module having a front wall proximate to the front edge, the dual connector module having a latch at the front wall movable between a latched position and an unlatched position, the latch engaging the latching feature of the first electrical connector in the latched position to hold the dual connector module in the mated position with the first electrical connector, the dual connector module having an ejector at the front wall operably coupled to the latch, the ejector being actuated in an actuation direction to release the latch and eject the dual connector module from the mated position to the unmated position after the latch is moved from the latched position to the unlatched position.

2. The dual connector system of claim **1**, wherein the ejector forces the dual connector module in an unmating direction as the ejector is actuated after the latch is moved to the unlatched position.

3. The dual connector system of claim **1**, wherein the latch includes a support beam imparting a return force to return the latch to the latched position.

4. The dual connector system of claim **3**, wherein the return force forces the ejector to return to a released position.

5. The dual connector system of claim **1**, wherein the latch is lifted upward in an unlatching direction perpendicular to the acting direction of the ejector.

6. The dual connector system of claim **1**, wherein the latch includes a latching beam engaging the latching feature and a support beam fixed to the front wall, the support beam being elastically deformed as the latch is moved from the latched position to the unlatched position, the support beam returning to an undeformed state when the ejector is released to return the latch to the latched position.

7. The dual connector system of claim **1**, wherein the ejector extends forward of the front wall and is pushed rearward toward the front wall to actuate the latch, the ejector pushing the dual connector module rearward to the unmated position after the latch is released to the unlatched position.

8. The dual connector system of claim **1**, wherein the latch includes a cam surface, the ejector engaging the cam surface, the cam surface causing the ejector to return to a released position as the latch is moved downward from the unlatched position to the latched position.

9. The dual connector system of claim **1**, wherein the ejector is movable linearly parallel to the host circuit board between a released position and an actuated position, the latch being rotated upward from the latched position to the unlatched position as the ejector is moved rearward to the actuated position and rotated downward from the unlatched position to the latched position to cause the ejector to move forward to the released position.

10. The dual connector system of claim **1**, wherein the ejector is accessible forward of the dual connector module immediately above the first electrical connector.

11. A dual connector system comprising:

a host circuit board having a front mounting area and a rear mounting area;

a first electrical connector at the front mounting area of the host circuit board, the first electrical connector having a housing having a card slot, the housing holding first contacts at the card slot, the first contacts being terminated to the host circuit board, the first electrical connector having a latching feature;

a second electrical connector at the rear mounting area of the host circuit board, the second electrical connector having a housing having an upper mating surface, the housing holding second contacts at the upper mating surface, the second contacts being terminated to the host circuit board;

a dual connector module matable with the first and second electrical connectors, the dual connector module having a module circuit board including an upper surface and a lower surface facing the host circuit board, the module circuit board having at least one communication component on the upper surface, the module circuit board extending between a front edge and a rear edge, the module circuit board having front contact pads proximate to the front edge for electrically connecting to the first electrical connector, the module circuit board having rear contact pads remote from the front edge for electrically connecting to the second electrical connector, the dual connector module having a front wall proximate to the front edge, the dual connector module having a latch at the front wall movable between a latched position and an unlatched position, the latch engaging the latching feature of the first electrical connector in the latched position, wherein the dual connector module is coupled to the host circuit board by lowering the dual connector module in a loading direction generally perpendicular to the host circuit board to a pre-staged, unmated position where the first connector interface is adjacent to the first electrical connector and the second connector interface is adjacent to the second electrical connector, and wherein the dual connector module is slid forward from the pre-staged, unmated position to a mated position in a mating direction generally parallel to the upper surface of the host circuit board to mate the first connector interface to the first electrical connector by loading the front edge of the module circuit board into the card slot of the first electrical connector to mate the first contacts to the first contact pads and to mate the second connector interface to the second electrical connector to mate the second contacts to the second contact pads; and

an ejector provided at the front wall being operably coupled to the latch, the ejector is actuated in an actuation direction parallel to the host circuit board to release the latch and eject the dual connector module in an unmating direction from the mated position to the unmated position after the latch is moved from the latched position to the unlatched position.

12. The dual connector system of claim 11, wherein the ejector forces the dual connector module in an unmating direction as the ejector is actuated after the latch is moved to the unlatched position.

13. The dual connector system of claim 11, wherein the latch imparts a return force to force the ejector to return to a released position.

14. The dual connector system of claim 11, wherein the latch is lifted upward in an unlatching direction perpendicular to the acting direction of the ejector.

15. The dual connector system of claim 11, wherein the latch includes a latching beam engaging the latching feature and a support beam fixed to the front wall, the support beam being elastically deformed as the latch is moved from the latched position to the unlatched position, the support beam returning to an undeformed state when the ejector is released to return the latch to the latched position.

16. The dual connector system of claim 11, wherein the ejector extends forward of the front wall and is pushed rearward toward the front wall to actuate the latch, the ejector pushing the dual connector module rearward to the unmated position after the latch is released to the unlatched position.

17. The dual connector system of claim 11, wherein the latch includes a cam surface, the ejector engaging the cam surface, the cam surface causing the ejector to return to a released position as the latch is moved downward from the unlatched position to the latched position.

18. The dual connector system of claim 11, wherein the ejector is movable linearly parallel to the host circuit board between a released position and an actuated position, the latch being rotated upward from the latched position to the unlatched position as the ejector is moved rearward to the actuated position and rotated downward from the unlatched position to the latched position to cause the ejector to move forward to the released position.

19. A dual connector system comprising:

a host circuit board having a front mounting area and a rear mounting area;

a first electrical connector at the front mounting area of the host circuit board, the first electrical connector having a housing having a card slot, the housing holding first contacts at the card slot, the first contacts being terminated to the host circuit board, the first electrical connector having a latching feature;

a second electrical connector at the rear mounting area of the host circuit board, the second electrical connector having a housing having an upper mating surface, the housing holding second contacts at the upper mating surface, the second contacts being terminated to the host circuit board;

a dual connector module movable between a mated position and an unmated position with the first and second electrical connectors, the dual connector module having a module circuit board including an upper surface and a lower surface facing the host circuit board, the module circuit board having at least one communication component on the upper surface, the module circuit board extending between a front edge and a rear edge, the module circuit board having front contact pads proximate to the front edge for electrically connecting to the first electrical connector, the module circuit board having rear contact pads remote from the front edge for electrically connecting to the second electrical connector, the dual connector module having a shell on the module circuit board;

a latch coupled to the shell and being movable between a latched position and an unlatched position, the latch having a base, a support beam extending from the base to a fixed end fixed to the shell, and a latching beam extending from the base being configured to engage the latching feature of the first electrical connector when the dual connector module is in the mated position, the latch being releasable by lifting the latch from the

latched position to the unlatched position using an actuator, the support beam being elastically deformed from the fixed end when the latch is moved from the latched position to the unlatched position, the support beam returning to an undeformed state when the lifting force is released to return the latch to the latched position.

20. The dual connector system of claim **19**, wherein the dual connector module includes an ejector defining the actuator, the ejector being provided at the front wall and being operably coupled to the latch, the ejector being actuated in an actuation direction parallel to the host circuit board to release the latch and eject the dual connector module in an unmating direction from the mated position to the unmated position after the latch is moved from the latched position to the unlatched position.

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